Attention-Deficit/Hyperactivity Disorder (ADHD) Medication Conversion Aid*				
Current Medication	**Current Total Daily Dose (mg/day)**	**Conversion Factor**	**New Medication**	**Total Daily Dose (mg/day)**
Amphetamine Salts				
Mixed Amphetamine Salts Immediate-Release (IR)/ Extended-Release (ER)	20 mg	1	**Mixed Amphetamine Salts IR/ER**	20 mg (may divide IR dose in 1 to 3 equally divided doses)
	20 mg	2	**Methylphenidate HCl IR/ER**	40 mg* (may divide IR dose in 1 to 3 equally divided doses)
*Alternatively, consider switching amphetamines to methylphenidate at the same dose and titrating up				
Mixed Amphetamine Salts IR/ER	20 mg	2.5	**Vyvanse** (lisdexamfetamine dimesylate)	50 mg
Mixed Amphetamine Salts IR/ER	20 mg	0.625	**Adzenys XR-ODT, Adzenys ER (amphetamine) ODT-XR tablet and ER oral suspension**	12.5 mg
Adzenys XR-ODT, **Adzenys ER** (amphetamine) **ODT-XR tablet and ER oral suspension**	12.5 mg	1.6	**Mixed Amphetamine Salts IR/ER**	20 mg (may divide IR dose in 1 to 3 equally divided doses)
Lisdexamfetamine				
Vyvanse (lisdexamfetamine dimesylate)	10 mg	~0.77	**Methylphenidate HCl IR/ER**	7.7 mg* (may divide IR dose in 1 to 3 equally divided doses)
Vyvanse (lisdexamfetamine dimesylate)	50 mg	0.4 - 0.6	**Mixed Amphetamine Salts IR/ER**	25 mg* (may divide IR dose in 1 to 3 equally divided doses)

Attention-Deficit/Hyperactivity Disorder (ADHD) Medication Conversion Aid*				
Current Medication	**Current Total Daily Dose (mg/day)**	**Conversion Factor**	**New Medication**	**Total Daily Dose (mg/day)**
Methylphenidate and Derivatives				
Aptensio XR (methylphenidate HCl) capsule	10 mg	1	**Methylphenidate HCl IR/ER**	10 mg (may divide IR products in 1 to 3 equally divided doses)
Dexmethylphenidate HCl IR/ER	10 mg	2	**Methylphenidate HCl IR/ER**	20 mg (may divide IR products in 1 to 3 equally divided doses)
		1	**Dexmethylphenidate HCl IR/ER**	10 mg (may divide IR products in 1 to 3 equally divided doses)
Methylphenidate HCl IR	15 mg (may divide IR dose in 1 to 3 equally divided doses)	~0.67	**Daytrana** (methylphenidate transdermal) patch	10 mg/ 9 hr wear time
Daytrana (methylphenidate transdermal) patch	10 mg/ 9 hr wear time	1.5	**Methylphenidate HCl IR**	15 mg (may divide IR dose in 1 to 3 equally divided doses)
Methylphenidate HCl IR/ER	20 mg	0.5	*The conversion of methylphenidate to dextroamphetamine/amphetamine is done at approximately ½ the dose of methylphenidate. However, it may be reasonable for children who are already receiving ≥ 20 mg/day methylphenidate to convert to dextroamphetamine-amphetamine at a starting dose of 10 mg once per day and titrate based on response.	
		1.3	**Vyvanse** (lisdexamfetamine dimesylate)	26 mg* (available in 20 mg, 30 mg)
Concerta (methylphenidate osmotic release) ER tablets	18 mg	~0.56	**Daytrana** (methylphenidate transdermal) patch	10 mg/ 9 hr wear time
Daytrana (methylphenidate transdermal) patch	10 mg/ 9 hr wear time	1.8	**Concerta** (methylphenidate osmotic release) ER tablets	18 mg

The recommendation for the following medications is to start with the initial dose and titrate when switching due to pharmacokinetics and salt form differences*

Adhansia XR

Adzenys XR-ODT
(if switching to another product other than Adderall XR)

Azstarys

Dyanavel XR

Evekeo ODT

Jornay PM

Mydayis

QuilliChew ER

Quillivant XR

Chart Considerations

The ADHD Medication Conversion Aid is not an all-inclusive list of strengths and dose conversions from one medication to another medication, the chart is intended to be an aid for how to make these mathematical conversions based on available evidence from expert consensus, journal articles, product labeling, and online dose calculators.

Note that the dosing provided does not account for pharmaceutical labeling indications such as age. Please consult labeling for dose recommendations based on age.

New medication total daily doses may need to be rounded to the nearest available strength or rounded as clinically appropriate by the prescriber. Also, total daily dose may be dosed in partial tablets depending on the dose. For example, Ritalin (methylphenidate IR) is available in 5 , 10 , and 20 mg doses, a dose of 8mg after conversion can be rounded up to 10 mg or rounded down, and the patient be given 1 and ½ tablets of 5 mg resulting in a 7.5 mg dose. Clinical judgment must be utilized independently of this aid when deciding whether to round up or down when dosing or titrating a medication.

Be aware to check product labeling for medications that can or cannot be crushed/split.

This chart should not replace clinical judgment, it is only to be used as an aid. Medication doses should be based on a wide variety of factors including body weight, patient age, severity of symptoms, response to medication or previous medications, medication duration of action, concurrent medications, comorbid conditions, and patient specificity (e.g., sex, ethnicity, age etc.).

For a more detailed and accurate approach to converting between ADHD medication products and the methodology of conversion factors see “Guidance for Off-Label Conversions.”

Guidance for Off-Label Conversions

Product labeling should be given strong consideration when converting from one stimulant medication to another. However, product labeling is silent on most stimulant conversions. This may be because labeling for older products has not been updated as newer products have been approved, or because manufacturers of newer products did not offer guidance on product conversions when seeking approval with the U.S. Food and Drug Administration. Clinicians wishing to undertake a conversion should treat any conversion factors as suggestions that will need to be tailored to the patient’s clinical presentation. Patients whose behavioral symptoms are a very significant impairment may benefit from more aggressive dosing, while patients at higher risk for adverse effects (including, but not limited to, cardiac abnormalities, insomnia, or anorexia) may need to be converted with more cautious doses. This section will provide guidance on how to conceptualize off-label conversions and how to create off-label conversions on an *ad hoc* basis.

If product labeling does not suggest a conversion to the target medication, it may be appropriate to consider reversing a conversion that exists for the starting medication. For example, if a patient was taking dexmethylphenidate immediate-release 5 mg, 1 tablet twice daily and the prescriber wished to convert to methylphenidate immediate-release tablets, the labeling for methylphenidate may be silent on the conversion. However, the labeling for dexmethylphenidate tablets suggests that converting to dexmethylphenidate from methylphenidate involves dividing the methylphenidate dose by 2. Therefore, it may be clinically reasonable to multiply the dexmethylphenidate dose by 2 to reverse this process, resulting in a suggested dose of methylphenidate immediate release 10 mg, 1 tablet twice daily.

In most cases, however, off-label conversions will require patient-specific consideration of biopharmaceutic, pharmacodynamic, and pharmacokinetic factors. Biopharmaceutic factors pertain to the medication’s dosage form and formulation, including salt forms (for

example, amphetamine sulfate versus mixed amphetamine salts). Pharmacodynamic factors pertain to the way that the medication's active ingredients interact with the body and may be most relevant when converting between methylphenidate products and amphetamine products. Pharmacokinetic factors pertain to the way in which the body will absorb, activate, and metabolize the medication, and may be particularly relevant for medications with both immediate- and extended-release formulations.

Biopharmaceutic Factors

In general, the term *biopharmaceutics* refers to the study and engineering of medication dosage forms (Mobley, 2013). This includes the medication's inactive ingredients and variations in extended-release formulations. Medication salt forms must also be considered in the discussion of biopharmaceutic factors. A medication is said to be formulated as a salt if its active ingredient is bound to a counterion or other molecule. This may be done to help the medication remain stable in solid forms or to alter other biological or chemical characteristics (Paulekuhn, Dressman, & Saal, 2007). Different salt forms can be recognized by inclusion of the salt form's name after the name of the active ingredient, as with "sulfate" in "amphetamine sulfate" or "dimesylate" in "lisdexamfetamine dimesylate." A medication formulated without a salt form can be referred to as the "base" medication.

Under the assumption that salt forms do not have a significant and predictable impact on parameters such as absorption time, equivalent dosages of a medication in its base form should be equivalent. Therefore, differences in molecular weights of different salt forms can complicate conversion between stimulants. For example, labeling for methylphenidate extended-release orally disintegrating tablets (ODTs) state that the product contains methylphenidate base molecules that are bound to a polymer. Thus, methylphenidate extended-release ODT products are dosed by methylphenidate base and may appear to contain smaller dosages than the corresponding methylphenidate hydrochloride products. As a result, labeling for methylphenidate extended-release ODT states that 8.6 mg of that product contains the same amount of methylphenidate as 10 mg of the methylphenidate hydrochloride salt form; conversely, hydrochloride takes up 1.4 mg of every 10 mg of methylphenidate hydrochloride. Similarly, each molecule of amphetamine sulfate contains two amphetamine base moieties bound to a single sulfate counterion. Therefore, converting from amphetamine sulfate to amphetamine base requires factoring out the mass of the sulfate counterion, then accounting for the fact that two amphetamine groups are present in each unit of amphetamine sulfate. Arguably the most complicated salt form among the stimulants is mixed amphetamine salts (MAS), which contain equal parts by mass of dextroamphetamine saccharate, dextroamphetamine sulfate, amphetamine aspartate monohydrate, and amphetamine sulfate. However, a full consideration of MAS equivalent dosing will also require a discussion of pharmacodynamics.

Pharmacodynamic Factors

In pharmacy, *pharmacodynamics* is a blanket term that refers to the study of how medications act upon the body. This term may refer to mechanisms of action, receptor binding affinities, and other means by which a medication may exert therapeutic or adverse effects. The major pharmacodynamic distinction in stimulant medications is the distinction between amphetamine derivatives and methylphenidate derivatives. Amphetamine derivatives are believed to exert therapeutic effect by blocking reuptake of catecholamines (i.e., dopamine and norepinephrine), but may also promote catecholamine release from neurons (Stahl, 2013). Methylphenidate derivatives are believed to act primarily as catecholamine reuptake inhibitors (Stahl, 2013). Therefore, both types of agents are believed to increase dopaminergic and noradrenergic tone and therefore neurological activity in the prefrontal cortex, but amphetamine derivatives may have a "two-hit" mechanism of action, while methylphenidate products may have a "one-hit" mechanism of action.

These differing mechanisms of action complicate conversion between amphetamine derivatives and methylphenidate derivatives. Relatively few head-to-head studies exist. One study of 58 children published in 2000 comparing dosages of MAS and methylphenidate found that

final methylphenidate doses were approximately double the final doses of MAS, with a broad standard deviation in the methylphenidate group (Pliszka, Browne, Olvera, & Wynne, 2000). Labeled dosages for methylphenidate are also approximately double the labeled dosages of MAS. Thus, it may sometimes be reasonable to assume that methylphenidate dosages are roughly double the comparable dosages of MAS (Comparison of ADHD Medications (United States), 2022). However, providers should use this conversion with care and should place the conversion in the context of the severity of the patient's ADHD symptoms and the potential adverse effects that the patient may experience when switching from methylphenidate derivatives to amphetamine derivatives.

Another source of pharmacodynamic complication is the possible variability in biological activity of stereoisomers of the same compound. Many medications, including methylphenidate and amphetamine, are chiral compounds. This means that these compounds have two or more forms with the same chemical and structural formulas, but different orientations in three-dimensional space. For example, amphetamine sulfate exists as a mixture of equal parts of the dextro-isomer and levo-isomer of amphetamine sulfate. This equal mixture of stereoisomers is called a racemic mixture, and the stereoisomers are sometimes called dextroamphetamine and levoamphetamine. Similarly, "methylphenidate" exists as a mixture of dextro- and levo-isomers. Unless otherwise specified, medications are generally assumed to be racemic or equal mixtures of stereoisomers, if a chiral center is present. Thus, "amphetamine sulfate" is an even mixture of dextroamphetamine sulfate and levoamphetamine sulfate, while "dextroamphetamine sulfate" contains only the dextroamphetamine moiety.

The field of pharmacy often assumes that certain stereoisomers are relatively inert (McConathy & Owens, 2003). This assumption is illustrated by the labeled conversion between dexmethylphenidate and methylphenidate: labeling for dexmethylphenidate assumes that patients who are prescribed methylphenidate can switch to dexmethylphenidate at one-half of their methylphenidate dose. Thus, the labeling assumes that only dexmethylphenidate has a therapeutic effect in most people. In principle, omitting any other isomers may therefore reduce the risk of side effects without compromising therapeutic outcomes (McConathy & Owens, 2003).

The assumption that one stereoisomer is biologically inert may not be true or may not be completely true for every patient. For example, levoamphetamine seems to produce fewer effects in the central nervous system than dextroamphetamine but has some effect in the brain and some effects in the periphery (Berman, Kuczenski, McCracken, & London, 2008). Therapeutic and adverse effects of levoamphetamine may therefore be uncertain and may vary from patient to patient. The reasons for this potential variation in response are likely to be broad and may include pharmacogenomic factors or variations in patient expectations.

Despite the limits of these assumptions, the simplest way to convert between stimulants may be to convert the starting medication's dosage to the base equivalence of the more pharmacologically active agent—usually dextroamphetamine base or dexmethylphenidate base. If a product exists as a racemic mixture, this can usually be done by dividing the base dose in half. For example, 8.6 mg of methylphenidate base—the labeled equivalence for 10 mg of methylphenidate hydrochloride—could be roughly equivalent to 4.3 mg dexmethylphenidate base.

Since MAS includes two racemic amphetamine salts and two dextroamphetamine salts, converting to dextroamphetamine base equivalents would involve uneven divisions of dosages of each component. Labeling for MAS extended-release capsules has already performed this conversion: product labeling states that the MAS extended-release contains 3.1 units of dextroamphetamine base to 1 unit of levoamphetamine base. Labeling for this product also presents the results of this conversion in mass units: 10 mg of MAS extended-release is stated to contain a total of 6.3 mg of amphetamine base equivalence, of which 4.7 mg is dextroamphetamine base and 1.5 mg is levoamphetamine base. Thus, it may be reasonable to assume that 10 mg of MAS extended-release would be comparable to approximately 5 mg of dextroamphetamine extended-release, though this conversion would ignore the role that levoamphetamine may have in therapeutic or adverse effects.

Pharmacokinetic Factors

Pharmacokinetics is the study of how medications are absorbed, distributed, metabolized, and eliminated by the body. Thus, this field includes studies of anticipated durations of action and peak blood concentrations. Pharmacokinetics may also be relevant when discussing medications that are converted to their active form by the body after the medication is taken. Medications formulated in this way are referred to as *prodrugs* and include lisdexamfetamine and serdexmethylphenidate.

Pharmacokinetic factors are of most obvious concern when converting to or from an extended-release formulation. Different extended-release formulations of the same active ingredient will have different durations of action, and some extended-release products will release medication in multiple "phases". For example, labeling for the methylphenidate extended-release ODT indicates that the product acts over approximately 12 hours and releases its methylphenidate in two phases, with 25% being released immediately and 75% being released with a peak in concentration approximately 5 hours later. By contrast, the methylphenidate extended-release/delayed-release extended-release capsules should not release significant amounts until they have been in the body for at least 10 hours, after which time the medication is released in one phase with a maximum concentration occurring approximately 14 hours after dosing.

In principle, it should be possible to estimate the immediate-release conversion for any corresponding extended-release product, though the immediate-release doses may be scheduled for inconvenient times. For example, in the methylphenidate extended-release ODT example, 25% of the equivalent methylphenidate base dose could be given as immediate-release methylphenidate tablets, with 75% of the corresponding methylphenidate base dose being administered approximately 4 to 5 hours later. Similar conversions could be constructed as-needed by consulting the labeling for most methylphenidate extended-release products.

Special attention must be given to the stimulants that are converted to their active form by the body. According to product labeling, lisdexamfetamine is converted to dextroamphetamine base after the prodrug is absorbed into the bloodstream. Labeling for the commercially available lisdexamfetamine dimesylate product states that 20 mg of this product contains 11.6 mg of lisdexamfetamine base. Given that the prodrug is converted to dextroamphetamine on a 1:1 basis and given that the molecular weight of lisdexamfetamine base is 263.38 mg per mmol, 20 mg of lisdexamfetamine dimesylate can be expected to produce 0.0440428 mol of dextroamphetamine base under physiological conditions (National Center for Biotechnology Information, PubChem Compound Summary for CID 11597698, Lisdexamfetamine, 2023). Since each dextroamphetamine sulfate molecule contains two dextroamphetamine base moieties and has a molecular weight of 368.5 mg per mmol, this amount of dextroamphetamine base should correspond to roughly 8.12 mg of dextroamphetamine sulfate (National Center for Biotechnology Information, PubChem Compound Summary for CID 5825, Dextroamphetamine sulfate., 2023). Extending these conversions to MAS or racemic amphetamine products will necessarily involve making some assumptions about the biological activity of levoamphetamine.

The commercially-available serdexmethylphenidate/dexmethylphenidate product is a more complicated example, as the dexmethylphenidate portion of this product acts immediately, while the serdexmethylphenidate portion must be activated. However, the product labeling provides conversions to dexmethylphenidate; for example, serdexmethylphenidate/dexmethylphenidate 26.1/5.2 mg is equivalent to 20 mg dexmethylphenidate hydrochloride or 17.3 mg dexmethylphenidate base.

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